

NO Fee

81688 U.S. PTO



05/02/97

PATENT

Docket No. A-5816

Box Patent Application
Commissioner of Patents and Trademarks
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): **Louis RYLES**

WARNING: Patent must be applied for in the name(s) of all of the actual inventor(s). 37 CFR 1.41(a) and 1.53(b).

For (title): **LIQUID FILTERING APPARATUS**

1. Type of Application

This new application is for a(n) (check one applicable item below):

☒ Original

☐ Design

☐ Plant

WARNING: Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. 371(c)(4) unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

NOTE: If one of the following 3 items apply, then complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED.**

☐ Divisional

☐ Continuation

☐ Continuation-in-part (CIP)

CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that this New Application Transmittal and the documents referred to as enclosed therein are being deposited with the United States Postal Service on this date _____ in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number _____ addressed to the: Commissioner of Patents and Trademarks, Washington, D.C. 20231.

(Type or print name of person mailing paper)

(Signature of person mailing paper)

NOTE: Each paper or fee referred to as enclosed herein has the number of the "Express Mail" mailing label placed thereon prior to mailing 37 CFR 1.10(b).

(Application Transmittal [4-1]-page 1 of 7)

2. Benefit of Prior U.S. Application(s) (35 USC 120)

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OR PRIOR U.S. APPLICATION(S) CLAIMED.

☐ The new application being transmitted claims the benefit of prior U.S. application(s) and enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed which are Required for Filing Date under 37 CFR 1.53(b)(Regular) or 37 CFR 1.153(Design) Application

12 Pages of Specification

3 Pages of Claims

1 Pages of Abstract

5 Sheets of Drawing

☒ Formal

☐ Informal

WARNING: *DO NOT submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. Comments on proposed new 37 CFR 1.86. Notice of March 9, 1988 (1990 O.G. 57-62).*

NOTE: *"Identifying indicia such as the serial number, group art unit, title of invention, attorney's docket number, inventor's name, number of sheets, etc., not to exceed 2% (7.0 cm) in width may be placed in a centered location between the side edges within three fourths inch (19.1 mm) of the top edge. Either this marking technique on the front of the drawing or the placement, although not preferred, of this information and the title of the invention on the back of the drawings is acceptable". Proposed 37 CFR 1.84(1). Notice of March 9, 1988 (1990 O.G. 57-62).*

4. Additional Papers Enclosed

☒ Preliminary Amendment

☐ Information Disclosure Statement

☐ Form PTO-1449

☐ Citations

☐ Declaration of Biological Deposit

☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative.

☐ Special Comments

☐ Other

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5. Declaration or Oath

- ☐ Enclosed
executed by (check all applicable boxes)
- ☐ inventor(s)
- ☐ legal representative of inventor(s). 37 CFR 1.42 or 1.43
- ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
- ☐ this is the petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is also attached. See Item 13 below for fee.
- ☒ Not Enclosed.

WARNING: Where the filing is a completion in the U.S. of an International Application but where a declaration is now available or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

- ☐ Application is made by a person authorized under 37 CFR 1.41(c) on behalf of all the inventor(s). The declaration or oath, along with the surcharge required by 37 CFR 1.16(e) can be filed subsequently.

NOTE: It is important that all the correct inventor(s) are named for filing under 37 CFR 1.41(c) and 1.53(b).

- ☐ Showing that the filing is authorized. (Not required unless called into question. 37 CFR 1.41(d)).

6. Inventorship Statement

WARNING: If the named inventors are each not the inventors of all the claims, an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

- ☒ The same
- or
- ☐ Are not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,
- ☐ is submitted.
- ☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. A verified English translation of the non-English language application and the processing fee of \$130.00 required by 37 CFR 1.17(k) is required to be filed with the application or within such time as may be set by the Office. 37 CFR 1.52(d).

NOTE: A non-English oath or declaration in the form provided or approved by the PTO need not be translated. 37 CFR 1.69(b).

- ☒ English
- ☐ non-English
- ☐ the attached translation is a verified translation. 37 CFR 1.52(d).

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[] is attached. (A separate "ASSIGNMENT COVER LETTER ACCOMPANYING NEW PATENT APPLICATION" is also attached.)

[] will follow.

9. Certified Copy

Australian (country)	PCT/AU95/00735 (appln. no.)	November 6, 1995 (filed)
(country)	(appln. no.)	(filed)
(country)	(appln. no.)	(filed)

[x] is (are) attached.

[] will follow.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 CFR 1.16)

A. ☐ Regular application

CLAIMS AS FILED			
Number Filed	Number Extra	Rate	Basic Fee \$ 770.00
Total Claims 37 CFR 1.16(c) <u>16</u> - 20	= <u> </u>	x \$ 22.00	= \$
Independent Claims 37 CFR 1.16(b) <u>2</u> - 3	= <u> </u>	x \$ 80.00	= \$
Multiple Dependent Claim(s), if any 37 CFR 1.16(d)			= \$ 260.00

☐ Amendment cancelling extra claims enclosed.

[] Amendment deleting multiple-dependencies enclosed.

☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing, they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 CFR 1.16(d).

Filing Fee Calculation \$0

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- B. ☐ Design Application
(\$300.00-37 CFR 1.16(f))

Filing Fee Calculation \$ _____

- C. ☐ Plant Application
(\$490.00-37 CFR 1.16(g))

Filing Fee Calculation \$ _____

11. Small Entity Statement(s)

- ☐ Verified Statement(s) that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is(are) attached.

Filing Fee Calculation (50% of A, B or C above) \$ _____

NOTE: Any excess of the full fee paid will be refunded if a verified statement and a refund request are filed within 2 months of the date of timely payment of a full fee. 37 CFR 1.26(a).

12. Request for International-Type Search (37 CFR 1.104(d)) (complete, if applicable)

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at this Time

- ☒ Not Enclosed
- ☐ No filing fee is to be paid at this time. (This and the surcharge required by 37 CFR 1.16(e) can be paid subsequently.)
- ☐ Enclosed
- ☐ Basic Filing Fee \$ _____
- ☐ Recording Assignment (\$40 - 37 CFR 1.21(h)) \$ _____
- ☐ Petition fee for filing by other than all the inventors or person on behalf of the inventor where inventor refused to sign or cannot be reached. (\$120.00 - 37 CFR 1.47 and 1.17(h)) \$ _____
- ☐ For processing an application with a specification in a non-English language. (\$130 - 37 CFR 1.52(d) and 1.17(k)) \$ _____
- ☐ Processing and retention fee (\$130 - 37 CFR 1.53(d) and 1.21(l)) \$ _____
- ☐ Fee for international-type search report (\$40 - 37 CFR 1.21(e)) \$ _____

NOTE: 37 CFR 1.21(f) establishes a fee for processing and retaining any application which is abandoned for failing to complete the application pursuant to 37 CFR 1.53(d) and this, as well as the changes to 37 CFR 1.53 and 1.78, indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid or the processing and retention fee of § 1.21(l) must be paid within 1 year from notification under § 53(d).

Total Fees Enclosed \$ _____

14. Method of Payment of Fees

- ☐ Check in the amount of \$ _____
- ☐ Charge Account No. _____ in the amount of \$ _____. A duplicate copy of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 CFR 1.22(b).

15. Authorization to Charge Additional Fees

WARNING: If no fees are to be paid on filing, the following items should not be completed.

WARNING: Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.

- ☐ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. ____.
- ☐ 37 CFR 1.16(a), (f) or (g) (filing fees)
- ☐ 37 CFR 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 CFR 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendment after final action.

- ☐ 37 CFR 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
- ☐ 37 CFR 1.17 (application processing fees)

WARNING: While 37 CFR 1.17(a), (b), (c) and (d) deal with extensions of time under § 1.136(a), this authorization should be made only with the knowledge that: "Submission of the appropriate extension fee under 37 CFR 1.136(a) is to no avail unless a request or petition for extension is filed." (Emphasis added). Notice of November 5, 1985 (O.G. 27).

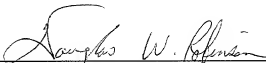
- ☐ 37 CFR 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 CFR 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the Notice of Allowance. 37 CFR 1.311(b).

NOTE: 37 CFR 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application...prior to paying, or at the time paying...Issue Fee". From the wording of 37 CFR 1.26(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

16. Instructions as to Overpayment

- ☐ Credit Account No. ____.
- ☐ Refund



SIGNATURE OF ATTORNEY

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Type or print attorney name

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Reg. No. 32,751

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☐ **Incorporation by reference of added pages**

Check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED

- ☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed
Number of pages added 27
- ☐ Plus Added Pages For Papers Referred To In Item 4 Above
Number of pages added _____
- ☐ Plus "Assignment Cover Letter Accompanying New Application"
Number of pages added _____

☐ **Statement Where No Further Pages Added**

(If no further pages form a part of this Transmittal then end this Transmittal with this page and check the following item)

- ☐ This transmittal ends with this page.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Louis RYLES

Group Art Unit:

Serial No.:

Examiner:

Filed : March 29, 1997

For : LIQUID FILTERING APPARATUS

PRELIMINARY AMENDMENT

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Prior to prosecution on the merits, kindly amend the above-referenced patent application as follows:

IN THE SPECIFICATION:

Kindly amend the specification as follows:

Page 1, line 2, delete "Technical Field" and insert

--Field of the Invention--.

Page 2, line 1, delete "Disclosure" and insert

--Summary--.

Page 5, line 33, delete "Best Modes for Carrying Out"

and insert --Detailed Description of the Invention--.

IN THE CLAIMS:

Kindly amend the claims as follows:

Page 13, line 1, after "CLAIMS" kindly insert the following line --WHAT I CLAIM IS--.

1. (Amended) [Liquid] A liquid filtering apparatus, [said apparatus including] comprising a chamber, a filtering element in said chamber, and valve means for directing liquid through said filtering element in a first direction for filtering said liquid, said valve means being operable to reverse [the] a direction of liquid flow through said filtering element when

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2. (Amended) [Liquid] A liquid filtering apparatus according to Claim 1, wherein said valve means [may include] comprises valves on opposite sides of said filtering element, said valves being adapted to be simultaneously opened and closed to reverse [the] said flow of liquid through said filtering element.

4. (Amended) [Liquid] A liquid filtering apparatus according to Claim 1, wherein said valve means include a movable valve member, said filter element being coupled to said valve member and being adapted to move said valve member to reverse [the] said flow of liquid through said filtering element.

6. (Amended) [Liquid] A liquid filtering apparatus according to Claim 1, wherein said filtering element comprises a porous membrane.

8. (Amended) [Liquid] A liquid filtering apparatus according to Claim 4, [and including] comprising means for opposing movement of said valve member to [its] a backwashing position.

9. (Amended) [Liquid] A liquid filtering apparatus according to [c]Claim 8, wherein said opposing means comprises

one of a biased element [or] and elements adapted to cooperate with said valve member upon a predetermined movement thereof.

10. (Amended) [Liquid] A liquid filtering apparatus according to Claim 8, wherein said opposing means comprises a spring which urges said valve member towards [its] a normal filtering position.

11. (Amended) [Liquid] A liquid filtering apparatus [including] comprising a chamber, and inlet to said chamber for liquid to be filtered and an outlet for said filtered liquid, [and] a discharge outlet, a filtering membrane in said chamber, [and] separating said chamber into first and second parts, and first valve means for varying [the] a direction of liquid flow through said chamber and said filtering element, said valve means in a first attitude causing said liquid to flow in a first direction through said chamber and said membrane for filtering of said liquid, said valve means in a second attitude causing liquid to flow through said chamber and said membrane in a second direction, opposite said first direction, for backwashing said membrane, said valve means being operable to reverse [the] said direction of liquid flow through said filtering membrane when excessive resistance to flow through said filtering membrane during filtering of said liquid occurs.

Claim 12, line 34, delete "Liquid" and insert --A liquid--; and

line 34, after "11" insert --,--.

Claim 13, line 1, delete "Liquid" and insert --A liquid--; and

line 1, after "12" insert --,--.

14. (Amended) [Liquid] A liquid filtering apparatus according to Claim 13, [and including] comprising further valve means for controlling communication of said second part of said chamber with waste, said further valve means being open in said second attitude of said valve means.

Claim 15, line 15, delete "Liquid" and insert --A liquid--; and

line 15, after 14, insert --,--.

Claim 16, line 19, delete [Liquid] and insert --A liquid--; and

line 19, after 15, insert --,--.

IN THE ABSTRACT:

Kindly add the following Abstract of the Disclosure shown on the attached page:

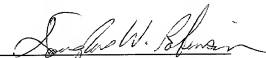
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REMARKS

The present Preliminary Amendment is submitted prior to prosecution on the merits in order to place the application in compliance with U.S. practice. The title of the various sections of the specification had been amended to comply with U.S. practice. The claims had been amended to similarly comply with U.S. practice and to provide proper antecedent basis for all terms. An Abstract of the Disclosure has been added.

Favorable consideration on the merits is respectfully requested.

Respectfully submitted,


Douglas W. Robinson
Reg. No. 32,751

May 1, 1997
(703) 415-0100

Attorney Docket No. **A-5816.PAM/dlg**

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IN THE ABSTRACT

--A liquid filtering apparatus which reduces or eliminates the need for regular manual cleaning or backwashing. Backwashing of the filter occurs automatically in response to sense conditions of filtering. In the filtering apparatus includes a chamber, a filter element in the chamber, a valve for directing liquid through the filtering element in a first direction to filter the liquid, the valve being operable to reverse the direction of liquid flow through the filtering element when excessive resistance to flow through the filter element occurs.--

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This invention relates to liquid filtering apparatus which has particular but not exclusive application to filtering water, for example water from swimming or spa pools.

Filtering apparatus is commonly used in swimming and spa pools for filtering the water in such pools. The apparatus which is in use is in a number of different forms ranging from cartridge type filters to sand and diatomaceous earth filters. Each type of filter is required to be regularly cleaned to maintain the efficiency of the filtering operation and also to ensure that excessive pressure loadings are not applied to the circulating pump. In the case of cartridge type filters, the filter is required to be disassembled, the filter cartridge removed and cleaned before reassembly. In the case of sand or diatomaceous earth filters, cleaning is accomplished by backwashing, that is by causing the flow of water to pass in a reverse direction through the filter to displace collected dirt from the filter material. Often backwashing is only carried out when the filter is substantially blocked and is normally achieved manually by operation of a valve to effect a reversal in the flow of the water. Usually also, the latter filters are required to be disassembled at regular intervals and recharged with sand or diatomaceous earth. The cleaning procedures described above are tedious and time consuming. Additionally, if these filters are not regularly cleaned, the efficiency of filtering is substantially reduced which, for example, reduces the efficiency of vacuum pool cleaners.

Liquid filtering apparatus is also used in many other applications for cleaning a liquid supply, for 35 example, in irrigation systems where water is required to be filtered to prevent blockage of water sprinklers or the like. This form of apparatus also is required to be regularly cleaned to maintain cleaning efficiency.

Disclosure of the Invention

The present invention aims to provide liquid filtering apparatus which reduces or eliminates the need for regular manual cleaning or backwashing. In particular
5 preferred aspect, the present invention aims to provide apparatus in which backwashing of the filter occurs automatically in response to sensed conditions of filtering. The filtering apparatus of the invention is suitable for a range of liquid filtering applications, such
10 as for filtering water for supply to swimming pools or spa pools, for filtering water for supply in irrigation systems or for filtering liquid in other liquid supply applications. Other objects and advantages of the invention will become apparent from the following
15 description.

The present invention thus provides in a preferred aspect, liquid filtering apparatus, said apparatus including a chamber, a filtering element in said chamber, and valve means for directing liquid through said
20 filtering element in a first direction for filtering said liquid, said valve means being operable to reverse the direction of liquid flow through said filtering element when excessive resistance to flow through said filtering element occurs.

Excessive resistance to flow through the filtering element causes an increase in pressure on the upstream side of the filtering element. The valve means may respond directly or indirectly to the increase in pressure to reverse the flow of liquid through the
25 filtering element whereby to backwash the filtering element when back pressure exceeds a predetermined limit.

The valve means may include valves on opposite sides of the filtering element. The valves may be simultaneously opened and closed to reverse the flow of
35 liquid through the filtering element. A further valve may also be provided which is opened upon reversing the flow through the filtering element to direct the backwash flow to waste.

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In one preferred form, the filtering element applies a force to the valve means to cause the valve means to be actuated to reverse the flow of liquid through the filtering element. The valve means may include a movable
5 valve member which is coupled to the filtering element and which is moved by the filtering element to a backwash position as a result of build-up of debris or other material on or in the filtering element, thus partially or fully blocking flow through the filtering element.

10 In the above, the valve means may comprise a first fixed duct having spaced apart ports therein on opposite sides of the filtering element, and a movable valve member coupled to the filtering element so as to be movable therewith to control the opening and closing of the
15 ports. In normal operation, one of the ports is open to direct liquid in a first direction through the filter element and the other port is closed. For backwashing, the one port is closed upon movement of the valve member and the other port is opened to direct liquid in the opposite
20 direction through the filtering element for backwashing.

When the flow of fluid reverses, the filtering element will be cleaned and the flow of fluid will cause, through pressure exerted on the filtering element, the valve means to operate to again reverse the flow for normal
25 operation. At the same time, the further valve will close to prevent dumping to waste.

Means are suitably provided for resisting or opposing movement of the valve member to its backwashing position. Such means may comprise a biased element or
30 elements adapted to co-operate with the valve member. The biasing means may additionally or alternatively comprise a spring which urges the valve member towards its normal filtering position. The bias of the biased element or elements or biasing means is required to be overcome to
35 enable the valve member to move to its backwash position.

The filtering element may be in the form of a porous fabric membrane. The filtering element may adopt opposite arcuate cross-sectional attitudes during filtering

and backwashing respectively. The filtering element may flex or flick between its two stable attitudes. This causes the pores of the filtering element to open when the filtering element moves to the backwash position to enhance cleaning of the element. Cleaning is also enhanced by the flexing of the element to its backwash position. A particularly suitable material for the filtering membrane comprises a polyester flannel fabric. A suitable pore size for the fabric comprises 25 micron. As an alternative, the fabric membrane may comprise a relatively stiff porous membrane.

Means may be provided for damping movement of the valve member and limit shock loadings on the valve member.

Means may also be provided for varying the time
15 during which backwashing occurs. Such means suitably
controls the movement of the valve member back to its
normal operating position. Such means may include a
chamber, the exhausting of fluid from which can be
selectively controlled.

20 In a further aspect, the present invention provides liquid filtering apparatus including a chamber, an inlet to said chamber for liquid to be filtered and an outlet for filtered liquid, and a discharge outlet, a filtering membrane in said chamber and separating said
25 chamber into first and second parts, and first valve means for varying the direction of liquid flow through said chamber and said filtering element, said valve means in a first attitude causing liquid to flow in a first direction through said chamber and said membrane for filtering of
30 said liquid, said valve means in a second attitude causing liquid to flow through said chamber and said membrane in a direction opposite said first direction for backwashing said membrane, said valve means being operable to reverse the direction of liquid flow through said filtering
35 membrane when excessive resistance to flow through said filtering membrane during filtering of said liquid occurs.

The valve means is extendably coupled to the filtering membrane and the filtering membrane may cause the

valve means to move between the first and second attitudes.

The valve means may include a movable valve member coupled to the membrane whereby when build up of debris and other materials on the filtering membrane during
5 filtering limits flow through the membrane, the membrane applies a force to the valve member and thus causes movement thereof.

The apparatus may also include further valve means for controlling communication of the second part of
10 the chamber with waste, the further valve means being open in said second attitude of the valve means.

The further valve means may be actuated by movement of the valve member. the further valve means may connect the second part of the chamber to waste, only after
15 a predetermined movement of the valve member.

Brief Description of the Drawings

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a
20 preferred embodiment of the invention and wherein :-

Fig. 1 is a side elevational view of the filtering apparatus of the invention;

Fig. 2 illustrates the interior of the body of the filtering apparatus;

25 Fig. 3 illustrates in sectional view, the filtering apparatus according to the invention in a normal filtering position;

Fig. 4 illustrates in sectional view, the filtering apparatus of Fig. 1 during backwashing;

30 and

Fig. 5 illustrates a modified form of filtering apparatus according to the invention.

Best Modes for Carrying Out the Invention

Referring to the drawings and firstly to Figs. 1
35 to 3, there is illustrated filtering apparatus 10 according to the present invention for normally filtering water of a swimming pool or spa but which may be used for filtering other liquids in other applications. The apparatus

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includes a hollow body or chamber 11 comprising an upper part 12 and a lower part 13 each of which have peripheral flanges 14 and 15 which are adapted to co-operate with an annular seal 16 and an annular clamp 17 which releasably and sealingly secures the two body parts 12 and 13 together about the seal 16. The seal 16 suitably is formed of a resilient material such as santoprene and the clamp 17 is preferably a metal clamp of the type known in the art which incorporates an over-centre lock or a screw tightening mechanism.

A discharge chamber 18 is provided at the lower end of the body part 13 being, for example, integrally formed with the part 13, and includes an outlet 19 for discharge water. The outlet 19 is normally connected to waste. An annular valve seat 20 is provided at the junction between the body part 13 and chamber 18.

Extending coaxially through the discharge chamber 18 into and terminating within the body part 12 is a fixed tubular inlet duct 21 which is closed at its end 22 located within the body part 12 and which is open at its other end 23. The end 23 is connected in use to the supply of liquid to be filtered, in the case of a swimming pool, to a pool pump which withdraws liquid from the pool for filtering. The duct 21 has a side wall 24 and upper and lower sets of ports 25 and 26 in the form of openings in the side wall 24.

Located coaxially about the duct 21 is a tubular valve member 27 which is provided with spaced apart openings 28 and 29 in its side wall 30. O-ring seals 31 may be provided between the side wall 30 of the valve member 27 and side wall 24 of the duct 21 on opposite sides of the ports 25 and 26 and openings 28 and 29. The lower end of the valve member 27 is provided with an outwardly directed flange 32, whilst the upper end is provided with an annular extension 33 having an outer frustoconical surface 34, the purpose of which will hereinafter become apparent. The upper end of the member 27 is substantially closed by an end wall 35 which is centrally apertured at 36

to permit a choke screw 37 threadably attached to the upper end of the duct 21 to pass therethrough. The screw 37 has an enlarged head 38 which is of a slightly greater diameter than the diameter of the aperture 36 and may have an outer tapering surface. A damping chamber 39 is defined between the wall 35 and the closed end 22 of the duct 21.

The upper end of the valve member 27 also includes an annular wall 40 spaced radially outwardly from the frustoconical surfaces 34. The annular wall 40 extends from a disc-like support 41 formed integrally with the valve member 27. The disc-like support 41 also defines a support flange 42 for a biasing spring 43 which is interposed between the flange 42 and end of the body part 12.

An annular poppet-like valve member 44 is located coaxially about the lower end of the valve member 27. The member 44 includes a lower annular wall 46 which normally seats on the valve seat 20 and an upper annular wall 47 spaced from the wall 46 and extending inwardly to the member 27 so as to allow relative movement therebetween but being substantially sealed thereto. An annular flange 32' is provided on the valve member 27 above the valve member 44.

The upper housing part 12 is provided with a central outlet duct 48 aligned with the inlet duct 21 and valve member 27. The outlet duct 48 extends into the body part 12 at 49 and has an outer diameter slightly less than the inner diameter of the annular extension 33. A plurality of fingers 50 are pivotally mounted at 51 to the upper end of the housing part 12 and arranged coaxially with the duct 48. An annular biasing member 52, such as a spring or O-ring is provided about the fingers 50 to normally bias the fingers 50 inwardly. The fingers 50 are tapered at their free ends to define inner inclined ramp surfaces 53.

Extending inwardly of the upper housing part 12 and coaxial with the duct 48 is a further annular wall 54 which has an outer diameter slightly less than the inner

diameter of the annular wall 40.

A filtering membrane 55 is connected between the seal 16 and valve member 27 and for this purpose is provided with an inner ring 56 located and captured in a recess or channel 57 on the valve member 27. The membrane 55 suitably comprises a fabric such as a polyester flannel fabric. The membrane 55 divides the body 11 into upper and lower chambers 58 and 59 respectively. In Fig. 3, the membrane 49 is arcuate in radial cross-section due to water flowing through it but may adopt an opposite arcuate attitude during backwashing as described further below. Alternatively, the membrane 50 may comprise a relative stiff membrane which has two stable states in which it is has an arcuate radial cross-section but which may flick or flex to an opposite stable arcuate state.

In normal operation as shown in Figs. 2 and 3, liquid passes into the duct 21, through the ports 26 and aligned openings 29 in the valve member 27 and through the membrane 55 for filtering before it passes around the top end of the valve member 27 and out of the outlet duct 48 as indicated by the arrows. At the same time, the ports 25 are blocked by the valve member 27 and the valve member 44 is seated on the valve seat 20. The valve member 27 is biased downwardly by the spring 43 with the annular flange 32 limiting downward movement of the valve member 27 by abutment with the valve member 44. Where debris and other materials collect on the filter membrane 55 and start to limit the flow of liquid therethrough, pressure will increase in the chamber 59. When the bias of the spring 43 is overcome, the valve member 27 will lift upwardly under the influence of the force on the membrane 45. The frustoconical surface 34 on the end of the valve member 27 will thus engage the surfaces 53 on the fingers 51 and the co-operation therebetween will cause the fingers 51 to be pivoted outwardly against the bias of the biasing member 51 applied by the member 52.

When the force of the biasing member 52 is overcome, the valve member 27 will rapidly move to the

and then the fingers 51 on member 52
of the surface 34

position of Fig. 4 where the annular extension 33 of the valve member 27 surrounds and closes the duct end 49 to prevent water flow therethrough. Movement of the valve member 27 to this position is further enhanced due to the back pressure created when the annular wall 40 approaches the wall 54 thereby throttling flow through the outlet 48 and creating a suction effect. Movement of the valve member 27 to this position, however, is damped through co-operation between the head 38 of the screw 37 and the opening 36. The small clearance between the head 37 and opening 36 will limit flow into the chamber 39 as it expands and thus have a dampening effect on movement of the valve member 27.

After a predetermined upward movement of the valve member 27, the flange 32 on the valve member 27 will engage the wall 47 of the valve member 44 causing the valve member 44 to lift upwardly to raise the annular member 46 from the seat 20. Thus there is a degree of lost suction between the valve member 27 and valve member 44. Additionally, the ports 26 will be blocked by the valve member 27, whilst the openings 28 will be moved into alignment with the ports 25. The liquid flowing through the inlet duct 21 will thus be redirected to pass through the ports 25 and openings 28 into the chamber 58 and thus flow through the membrane 55 in the opposite direction. This will cause the filter membrane 55 to rapidly move or flex to an opposite arcuate attitude as shown in Fig. 4 causing the membrane pores to open and debris therein to be flushed therefrom into the chamber 59. The filter membrane 55 is thus backwashed into the chamber 59 with backwash water flowing past the valve seat 20 into the discharge chamber 18 for discharge through the duct 19.

Water will only flow through the membrane 55 in this direction for a short period of time as this flow of water will cause a force to be exerted on the membrane 55 and thus on the valve member 27, thereby causing the valve member 27, the valve member 27 to move back towards the position of Fig. 2. The period of backwashing can be

adjusted by screwing the screw 37 in or out to reposition the head 38 of the screw. Furthermore, as the valve 27 moves towards the Fig. 1 position, the chamber 39 will be reduced in size and water therein past out between the screw head 38 and aperture 36. This restricted flow of water will again damp the movement of the valve member 27 until the head 38 clears the opening 36. The valve member 44, during this movement will also reseal on the valve seat 20 to cut off the flow to waste.

With the valve 27, again in the position of Fig. 1, flow into the chamber 59 will cause the element 55 to move back to its opposite position in Fig. 3 as illustrated for normal filtering.

Because of the flexing action of the filtering membrane 55 as described, only a small quantity of water is required for backwashing. The filtering apparatus 10 will function more efficiently than a normal filter which is usually only backwashed when the filtering membrane or elements are substantially blocked. The filtering apparatus of the present invention will thus allow for greater performance from vacuum pool cleaners, less power consumption and shorter running time. The apparatus 10 may be fitted directly to the top of a pump which results in space saving, particularly in smaller housing blocks, flats and units.

Many variations may be made to the invention without departing from the broad scope and ambit thereof. For example, the valve member 27 may be weighted to provide momentum to move it between its respective positions. The inlet pressure at the duct 21 may also be controlled by a regulator if necessary. The choke screw 35 may also be eliminated in which case the end wall 35 of the valve member 27 may be sealed. In this case to permit escape of water from the chamber 39, the end wall 22 of the duct 21 may be provided with a port. Whilst the spring 43 is shown to be external of the valve member 27, it may be provided internally thereof.

Fig. 5 illustrates a further embodiment of

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filtering apparatus 60 according to the invention which includes modifications which may be incorporated individually or in combination.

The apparatus 60 is similar to the embodiment of
5 Figs. 1 to 3 including an inlet duct 21, an outlet duct 48 and a slidable tubular valve member 27 which controls communication between the inlet duct 21 and chambers 58 and 59 on opposite sides of the membrane 55.

In this instance, however, the valve member 44 is
10 replaced by a slide valve member 61 which is movable with the valve member 27 and is normally in sealing engagement with an annular wall 62 which replaces the valve seat 20. As shown, the valve member 61 has a tapered end 63 which when adjacent the annular wall 62 permits communication
15 between the chamber 59 and chamber 18. This will not occur until a predetermined movement of the valve member 27 occurs (as in the embodiment of Figs. 1 to 3).

In this embodiment also, the ring 56 which supports the inner end of the membrane 55 is free for
20 limited sliding movement between annular stops 64 on the valve member 27 (as shown in dotted outline). By this arrangement an impact force may be applied to the valve member 27 upon reversing of the flow through the membrane 55 due to the ring 56 impacting against one or the other
25 annular stops 64. This assists in moving the valve member 27 between its two positions.

In a further modification, the inlet duct 21 may be provided with a port 65 communicating with the chamber 18. A valve member 66 is located about the inlet duct 21
30 and normally blocks the port 65. The valve member 66, however, may include an opening 67 which may be moved by rotating the member 66 into alignment with the port 65. This will remove water supply to the body 11 dumping the water inlet to waste and provide a safety measure if, for
35 example the filter is jammed in a backwash position. The embodiment of Fig. 5 also eliminates, as referred to previously, the adjustment screw 37.

The valve mechanism for use with the apparatus

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may also be substantially varied from that shown. For example, in one form the valves defined between the openings 29 and port 26 and openings 25 and port 28 may be replaced by solenoid valves as may the valve arrangement 5 defined between the valve member 44 and seat 20. In this form, one solenoid valve may be provided to control flow through the outlet 48, whilst the other solenoid valve controls flow to the chamber 59 and through the membrane 55 as well as the discharge to waste for backwashing. A 10 pressure sensor switch located in the chamber 59, upon sensing excess pressure will cause operation of the solenoid valves to prevent water flow through the outlet 48 and cause a reversal of flow through the filtering membrane 55 and open the chamber 59 to waste or discharge for 15 backwashing purposes. This may be done for a set period of time, after which the valves may again be reversed to permit flow through the outlet, close the waste valve and direct the flow in the normal direction through the membrane 55. The membrane 55 in this embodiment may be in 20 a similar form to that described with reference to the drawings except that in this instance it is fixed at its inner periphery.

The membrane 55, of course may be of many different forms and need not necessarily flex between the 25 opposite arcuate attitudes shown but may simply be substantially annular and bulge in opposite directions depending upon the direction of flow. The membrane in the form of Fig. 1, however, may be stiffened on either side by scrim and also may be multi-layered if desired.

30 The main body components of the embodiment of Figs. 1 and 2 are preferably formed of plastics by injection moulding or other corrosion resistant material.

Whilst the above has been given by way of illustrative embodiment of the invention, all such 35 modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as defined in the appended claims.

CLAIMS

1. Liquid filtering apparatus, said apparatus including a chamber, a filtering element in said chamber, and valve means for directing liquid through said filtering element in a first direction for filtering said liquid, said valve means being operable to reverse the direction of liquid flow through said filtering element when excessive resistance to flow through said filtering element occurs.
2. Liquid filtering apparatus according to Claim 1 wherein said valve means may include valves on opposite sides of said filtering element, said valves being adapted to be simultaneously opened and closed to reverse the flow of liquid through said filtering element.
3. Liquid filtering apparatus according to Claim 2 and including a further valve which is opened upon reversing the flow through said filtering element to direct the reverse flow to waste.
4. Liquid filtering apparatus according to Claim 1 wherein said valve means include a movable valve member, said filter element being coupled to said valve member and being adapted to move said valve member to reverse the flow of liquid through said filtering element.
5. Liquid filtering apparatus according to claim 4 wherein said valve means comprises a first fixed duct having spaced apart ports therein on opposite sides of said filtering element, and wherein said movable valve member is movable to control the opening and closing of said ports.
6. Liquid filtering apparatus according to Claim 1 wherein said filtering element comprises a porous membrane.
7. Liquid filtering apparatus according to Claim 6 wherein said filtering element separates said chamber into first and second parts, said valve means controlling the

supply of liquid to said first and second parts of said chamber.

8. Liquid filtering apparatus according to Claim 4 and including means for opposing movement of said valve member to its backwashing position.

9. Liquid filtering apparatus according to claim 8 wherein said opposing means comprises a biased element or elements adapted to cooperate with said valve member upon a predetermined movement thereof.

10. Liquid filtering apparatus according to Claim 8 wherein said opposing means comprises a spring which urges said valve member towards its normal filtering position.

11. Liquid filtering apparatus including a chamber, an inlet to said chamber for liquid to be filtered and an outlet for filtered liquid, and a discharge outlet, a filtering membrane in said chamber and separating said chamber into first and second parts, and first valve means for varying the direction of liquid flow through said chamber and said filtering element, said valve means in a first attitude causing liquid to flow in a first direction through said chamber and said membrane for filtering of said liquid, said valve means in a second attitude causing liquid to flow through said chamber and said membrane in a direction opposite said first direction for backwashing said membrane, said valve means being operable to reverse the direction of liquid flow through said filtering membrane when excessive resistance to flow through said filtering membrane during filtering of said liquid occurs.

12. Liquid filtering apparatus according to Claim 11 wherein said valve means is coupled to said filtering membrane and wherein said filtering membrane causes said valve means to move between said first and second attitudes.

13. Liquid filtering apparatus according to Claim 12 wherein said valve means includes a movable valve member coupled to said membrane and wherein build up of debris and other materials on said filtering membrane during filtering limits flow through said membrane causing said membrane to apply a force to said valve member and thus movement thereof.

14. Liquid filtering apparatus according to Claim 13 and including further valve means for controlling communication of said second part of said chamber with waste, said further valve means being open in said second attitude of said valve means.

15. Liquid filtering apparatus according to Claim 14 wherein said further valve means is actuated by movement of said valve member.

16. Liquid filtering apparatus according to Claim 15 wherein said further valve means connects said second part of said chamber to waste, only after a predetermined movement of said valve member.

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(54) Title: LIQUID FILTERING APPARATUS		
(57) Abstract <p>Liquid filtering apparatus (10) including a chamber (11) having a filtering membrane (55) therein. The filtering membrane (55) is coupled to a valve member (27) which controls flow of fluid through an inlet duct (21). In normal filtering, liquid is directed by the valve member (27) to one side (59) of the chamber (11) to pass through the filtering membrane (55). When pressure builds up in the chamber side (59) due to the membrane (55) becoming blocked with debris, a force is applied by the membrane (55) to the valve member (27) to reverse the supply of liquid to the chamber (11) to cause an opposite flow of liquid through the membrane (55) for cleaning thereof.</p>		



Figure 1.

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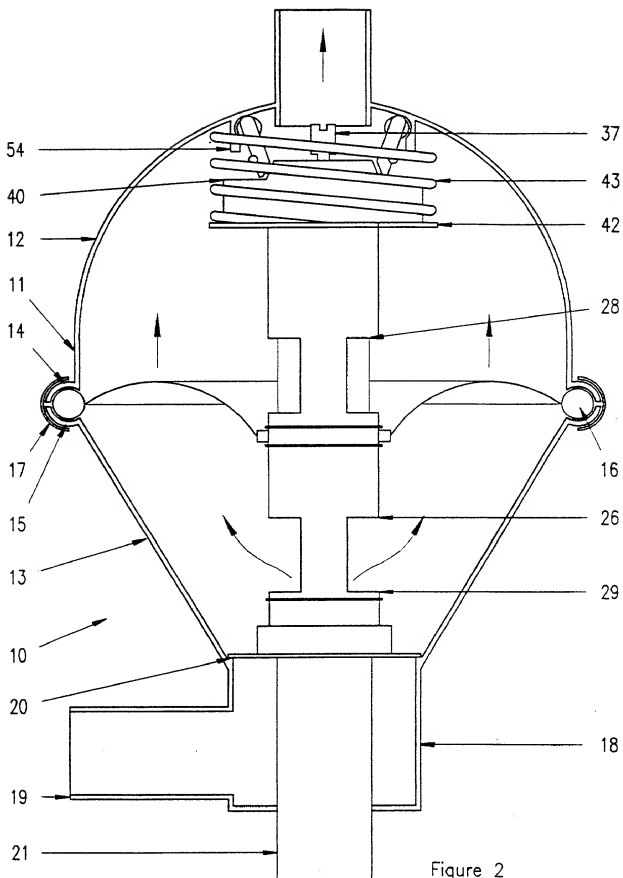


Figure 2

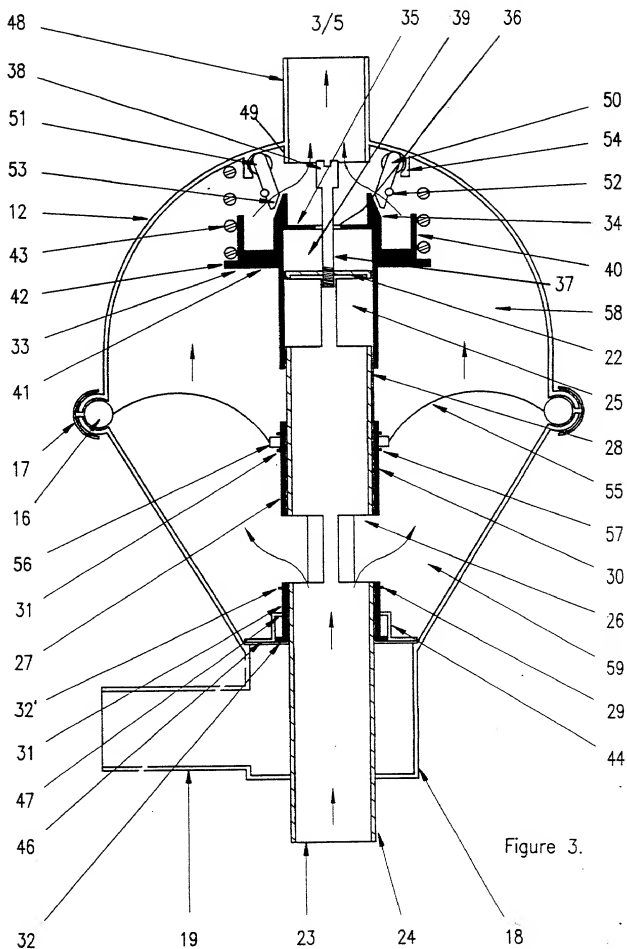
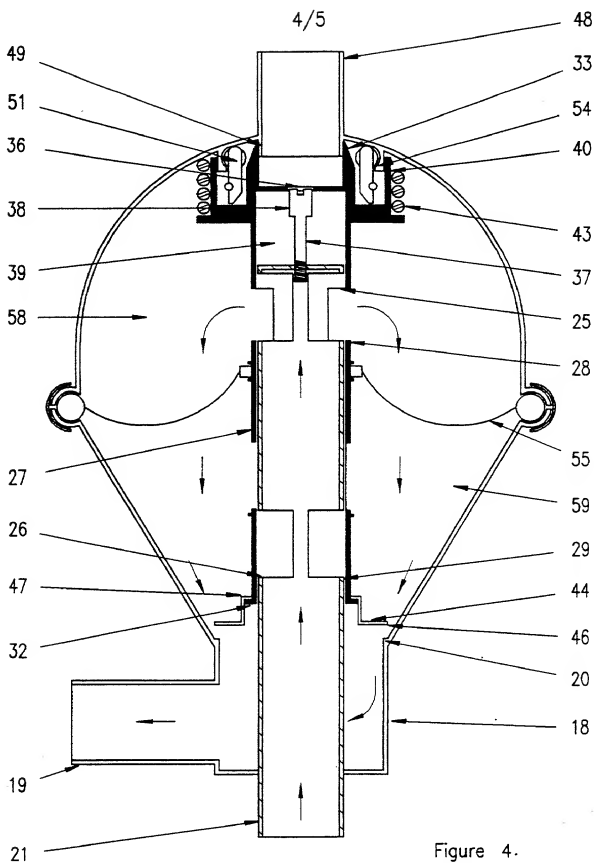


Figure 3.



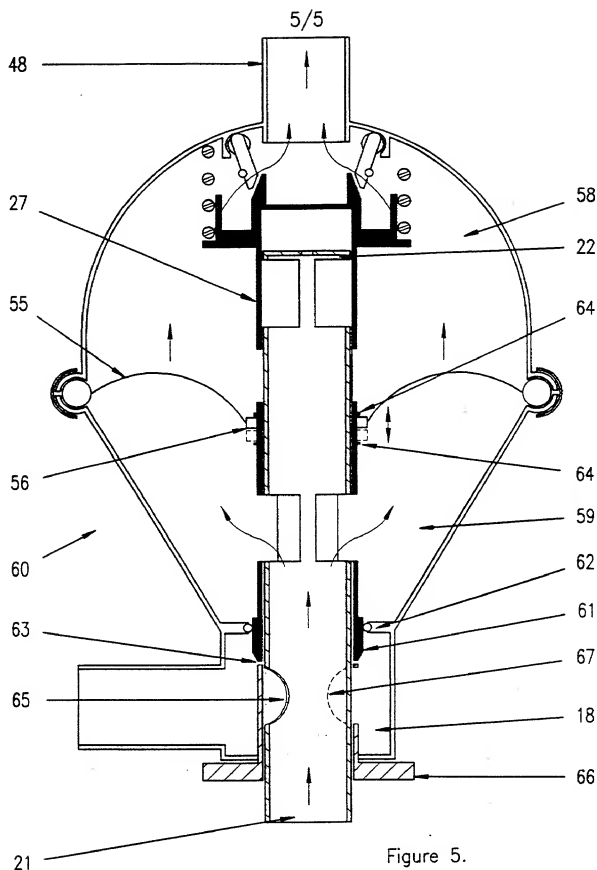


Figure 5.